Guidelines for Evaluating FAA Cost Estimates

Investment Cost Analysis Branch (ASD-410)

In an effort to ensure consistent, high-quality cost estimates throughout the Federal Aviation Administration (FAA), the Investment Cost Analysis Branch (ASD-410) has developed the following guidelines to be used for review of cost estimates and cost analyses. These guidelines should be applied to the following types of Investment Analysis (IA) documents, including:

- Independent Evaluation Reports,
- Investment Analysis Reports (IAR's),
- Cost-benefit analysis reports,
- Cost-effectiveness analysis reports, and
- Other related reports.

These cost guidelines can be applied in many circumstances. For cost estimators preparing their own products, the guidelines provide a quality control checklist to ensure that those products are complete, credible and understandable. For reviewers who must evaluate estimates provided by a product team or external source, the guidelines offer agenda for conducting a systematic and comprehensive review. Whatever the application, these guidelines may be adapted as necessary to fit the situation.

The guidelines reference a number of published references, including procedural guidance such as the AMS IA Process Guidelines and official data (e.g., OMB Circular A-94 discount rates). Users are encouraged to refer to those sources where appropriate and to ensure that those sources are up to date.

For further information about these guidelines and their use, or in the event of any errors, omissions or outdated information, please contact the Investment Cost Analysis Branch (ASD-410). Suggestions for improvement are always appreciated.

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General References

The following references are useful sources of information regarding a range of Investment Analysis topics, including cost estimating and analysis.

AMS Investment Analysis Process Guidelines. This document describes the process to be used during the Investment Analysis phase of the FAA's Acquisition Management System (AMS). The current version is accessible at the following Web address: http://fast.faa.gov/investment/index.htm.

Economic Analysis of Investment and Regulatory Decisions – Revised Guide (APO-98-4). This Guide presents methodology for applying economic analysis to the investment, regulatory, and grant award decisions commonly encountered by the Federal Aviation Administration. Cost-estimating methodologies and distributional impacts are discussed in detail. The Web address for the guide's current version is http://api.hq.faa.gov/apo3/tofc.htm.

General Characteristics

Judging the quality of a cost estimate (or cost analysis) depends on the following information being made available to the reviewer *for every estimate (or analysis)*:

- Clearly stated description of the purpose of and customers for the cost estimate
- Point-of-contact information for the estimators
- Clear, concise statement of the products, services and other components being estimated ("Technical Baseline")
- A schedule of the program or each alternative, in sufficient detail to inform the estimator of the time phasing:
    - Of hardware production and fielding
    - Of the introduction of services
    - Of the key operational and maintenance events
- A set of Ground Rules and Assumptions (GR&A), that should provide, at a minimum, the following information:
    - Time frame (life cycle) covered by the estimate
    - Identification of the major cost components are included in or excluded from the estimate
    - A brief description of the operational and maintenance concepts and their effect on cost and the allocation of costs to budgetary categories
- Description of the inputs and methods used, in sufficient detail to enable reproducibility of the estimate (and, if possible, demonstrated application of a clear and comprehensive standard estimation methodology)
- Description of data sources
- Application of a Work Breakdown Structure, such as the FAST WBS, to ensure that all cost categories have been addressed in a consistent manner
- Referencing of correct directives, as required
- Identification of all costs that will be incurred during the estimate's time frame, which might include:
    - Technology refresh activities
    - Service Life Extension Programs (SLEP's)
    - Decommissioning and disposal of hardware at the end of its service life

- Non-program-specific costs necessary for successful program implementation, including costs incurred by:
    - Airlines and other users--equipage, operations and maintenance
    - Other FAA lines of business (LOB's) and organizations
    - Other Federal government organizations (e.g., Department of Defense, NASA)
    - Local government organizations, including airport authorities
    - Foreign or international agencies
- Clear differentiation of costs by type of budget dollar. For example:
    - Research, Engineering & Development (RE&D)
    - Facilities and Equipment (F&E)
    - Operations & Maintenance (O&M)
- Presentation of costs in constant dollars and in current ("then year") dollars (Note: costs may also be presented, if required, in discounted constant dollars)
- Description of sensitivity analyses and cross-checks performed on key cost drivers (e.g., labor rates for O&M, prime mission equipment costs for F&E)
- Description of effect of technical, schedule and cost risk on program cost and schedule

If the cost estimate is incorporated into a cost-benefit analysis, the following additional information must be provided:

- Evidence that the social costs beyond the scope of the cost estimate have been considered (Note: social costs are usually considered in the benefits context)
- Evidence that the correct economic values have been assigned to time, life, injury and other benefits

When more than one estimate has been provided (as is the case for an analysis of alternatives), the reviewer should be provided with sufficient information in order to ensure that all relevant alternatives have been considered, including:

- Baseline ("do nothing") alternative
- Alternatives based on nonmaterial solutions
- Alternatives based on the addition of hardware or software
- Alternative estimates are comparable with respect to GR&A's, quality of data and methodology, distribution of costs, etc.

Guidelines

Topic	Evidence of Sufficient Coverage
AMS Special Topics in Investment Analysis	
Choice of Economic Service Life	Is the service life of the program activity clearly stated? Does service life correspond with Table 1 of the AMS Guidance? For example: do program-related facilities have a service life of 40 years? Is the service life of program-related, general-purpose telecommunications equipment ten years, etc? If not, what is the supporting rationale for departing from the official guidance?
Technology Refreshment of NAS Equipment	Does the estimate/analysis include costs of any equipment that require periodic refreshment? If so, does the estimate/analysis document the refreshment cycles and strategy? Are the lengths of refresh cycles consistent with FAA/industry standards?
Human Factors (HF)	Have human-factor elements and their effects on cost, schedule and performance been fully documented? If so, are the human-factor elements in accordance with accepted FAA standards?
Information Security (INFOSEC)	Are INFOSEC requirements reflected in the program's technical baseline, schedule and cost estimates?
System Safety Assessment	
OMB Circular A-94: Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs. The Policy volume was published in October 1992. Appendices (including discount rates) are updated annually, with the last edition published in February 2000. Note: A Web version is available at http://www2.whitehouse.gov/OMB/circulars/a094.	Does the estimate/analysis identify the discount factors used in the present-value calculations? DOT policy specifies use of the following • 7% real discount rate for programs that yield benefits to users • appropriate T-Bill and bond rates for acquisitions that yield benefits only to service providers See Circular A-94, Appendix C for discount rates. Section 13 provides guidance for lease-purchase analysis. APO Bulletin (APO-97-2) provides additional documentation.
OMB inflation/escalation-rate guidelines	Does the documentation's assumption section clearly show what inflation rates have been used? (Note: As of March 31, 2001, the annual inflation rate for 2002 is 1½%; the rate for future years is 2.0%.)

Guidelines (continued)

Additional items	
APO – Economic Values for Evaluation of Federal Aviation Administration Investment and Regulatory Programs (APO-98-8)	Does the estimate/analysis include any discussion or measurement of regulatory decisions? If so, then it should cite conventions used in APO's reference. Applicability – e.g., avionics costs, OSHA compliance cost
Work Breakdown Structure (WBS). Web site: http://fast.faa.gov/wbs/wbssec.htm.	Does the estimate/analysis use the standard WBS (i.e., in compliance with the AMS, and displayed on FAST URL at **http://fast.faa.gov/wbs/sld001.htm**)? If not, is the WBS documented?
FAA Lines of Business (LOB's) and other FAA organizations, e.g., Logistics Center, field offices, etc.	Have all interdependencies with other organizations/LOB's been captured in the estimate/analysis?
Aviation industry	Does the estimate/analysis include cost data obtained from the aviation industry or its related organizations? If yes, then are these cost data adequately documented and reproducible? Likewise, for data obtained from vendor quotes or market surveys.

Coordination

Topic	**Evidence of Sufficient Coverage**
NAS Architecture (ASD-100**)**	Has the cost analysis documentation been formally coordinated with ASD-110 regarding potential cost impact on the NAS architecture? Are the costs clearly identified as being incurred by the program or shared by other programs? Are the schedules in accord with NAS architecture?
Affordability	Has the program's affordability been coordinated with SAT/SEOAT?
O&M cost review (AFZ-400)	Does the documentation include O&M cost data? If so, then the same requirements for F&E analysis apply, e.g., BOE's. Has the documentation been formally coordinated with AFZ-400?

Cost Output

Topic	Evidence of Sufficient Coverage
Life-cycle cost estimates	
WBS element	Have the cost elements been identified and broken out by WBS category? Does the documentation identify the level of WBS used in the estimate/analysis?
Annual	Is each of the WBS cost elements identified for each year of the estimate/analysis time frame?
Funding category	Does the documentation break out costs separately by each major category, i.e., RE&D, F&E, O&M? Have the costs of decommissioning, salvage and restoration been identified?
Format	Does the documentation clearly label whether dollars are expressed in constant dollars, budget-year dollars, or another format?
Risk-based confidence intervals	Have the *low*, *most likely*, and *high* cost values been identified by phase (e.g., F&E, In Service)? (Note: in some situations, it may be appropriate to have this information provided at higher resolution.)
Basis of Estimates	
Methodology	Is the cost methodology consistent with *standard practices*? If not, what is the rationale for the variance?
Data sources	Does the documentation clearly identify all data sources used in the estimate/analysis? Is all non-FAA data clearly documented with respect to source (e.g., market survey data, industry-provided data, etc.)
Reproducibility	Is the estimate/analysis reproducible?
Clarity	Is the estimate/analysis and its documentation organized in a way that is clear straightforward and lends itself to audit?
Data collection and evaluation techniques, including quality assurance (QA)	Does the documentation explain how data were collected and evaluated, especially in the case of market surveys? Was QA consistent with ASD-400 approach?
Models employed	Does the documentation document and describe the cost models

	employed in the estimate/analysis? What is the currency of each model used? Are the assumptions of each model still valid?
Consistency with NAS Architecture	Are the cost-model inputs used consistent with NAS architecture guidelines? (cross-reference to Coordination section) If not, are the cost-model inputs reasonable and supported by documentation?
Reasonableness and comprehensiveness	Are the results of the cost model credible in terms of real-world conditions and constraints? Can we document the source and calibrate the results for future usage?
Program linkages and interfaces	Did the documentation identify FAA programs, activities, organizations or lines of business that may be affected by program execution? If so, are the linkages and interfaces documented.
Special topics	
Cost savings and cost avoidance identified as benefits	Has the documentation used cost avoidance as a benefit? If so, clearly document and confirm that entries have not been double counted. (Note: This assessment should be coordinated with ASD-430.)
Identify and document sunk costs	If the program involves sunk costs, those costs should be documented.

Special Analysis

Topic	**Evidence of Sufficient Coverage**
Trade-off and sensitivity analyses	Special types of study and subset of activities.
Maintenance	Is the study focussing on maintenance costs? Does it involve a trade study of government-versus-contractor costs? Level of repair (LOR)? Integrated logistics?
Lease vs. buy	Does the study focus on lease-or-buy analysis? If so make sure that OMB guidance (Circular A-94, Section 13) is followed.
Ad hoc studies	Is the analysis consistent with accepted/past practices, or does it set a precedent?
COTS vs. NDI vs. development	How much tailoring or customization is involved in the program's technical baseline? How is that tailoring or customization reflected in the cost estimate?
Technology refresh	Is it really tech refresh (F&E) or maintenance cost (O&M)? Rationale?
Technology obsolescence	What are the drivers for technology obsolescence? Examples include operating system, application software, hardware platform, supportability, and reliability, availability of parts, and high costs for O&M.

AMS Environment

Topic	Evidence of Sufficient Coverage
Mission Need	The Mission Needs Statement (MNS) is a required document that should be coordinated with ASD-100 and ASD-420. Has the needs identified in the MNS been addressed in the cost estimate? If not, has the reason been clearly stated?
Requirements	Has an initial Requirements Document (iRD) been completed and formally coordinated? If not, what is the explanation for this failure? Has a quality assessment been made of the iRD? Is the iRD readily mapped into cost elements? Note: this will probably be primarily an ASD-420 activity.
Operations concepts	Are the operational concepts feasible, reasonable, and cost-effective? Are they consistent with the NAS Architecture and the Final Requirements Document (FRD)?
Maintenance concepts	Is the maintenance concept consistent with NAILS plan and FRD?
Interface requirements	Which FAA programs absorb the interface cost(s)? Are the costs shared?
Concept of Operations (CONOPS)	How was a CONOPS document used in the preparation of the estimate/analysis? How well does the estimate/analysis map to the Technical Baseline?
Technical Baseline	Did the cost estimator in the preparation of the estimate/analysis use a Technical Baseline or Cost Analysis Requirements Document (CARD)? How well does the estimate/analysis map to the Technical Baseline?
Schedule	Did the cost estimator in the preparation of the estimate/analysis use a program schedule? How well does the estimate/analysis map to the schedule?

Alternatives

Topic	**Evidence of Sufficient Coverage**
Definitions	Are the alternatives clearly defined and enumerated?
Reference Case	Is a reference case clearly defined? Is it used as an alternative? (It should **not** be.)
Basic technical solution	Has the alternatives discussion included a basic technical solution?
No-cost or procedural alternative	Does the alternatives discussion address the possibility or availability of nonmaterial or procedural alternatives?